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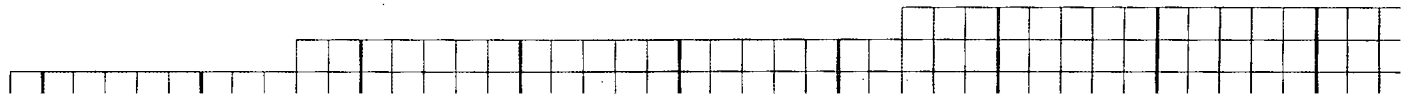
REPORT



December 29, 1989

Mr. Fred Estilo
Public Works Center, Bldg. 1-A
Great Lakes Naval Training Center
Great Lakes, IL 60088

RE: Contract N62472087-C-7706
Harbor Material Analysis

Dear Mr. Estilo:

STS Consultants, Ltd. has completed collection and analysis of harbor sediment samples at the above-referenced project. The project location is illustrated on Figure 1. The scope of work consisted of collecting continuous sediment samples for five feet from the harbor bottom at seven locations designated by the Public Works Center (PWC), homogenizing and preserving the sample, and analyzing each sample for parameters designated by the PWC. This letter report summarizes the method of analysis and results obtained.

Subsurface Exploration

A barge-mounted tripod drilling unit was used to recover core samples to a minimum depth of five feet into the harbor sediments. Boring locations were marked by buoys and located by land survey from marina structures. The boring locations are illustrated on Figure 2 in Appendix A.

Continuous sediment samples were recovered from each boring location using Osterberg, Shelby Tube, and lined Split Barrel samplers, depending upon the subsurface conditions encountered. The first foot of frozen soil at borings B-202 and B-203 (located on the sand bar in the boat basin) was broken and sampled with a hand shovel.

Samples were sealed in Shelby tubes, split barrel liners, and clean sample jars and were returned to the STS geotechnical laboratory.

A background water sample was collected from Lake Michigan south of the south breakwater. The sample was placed in containers supplied by the subcontract laboratory, and preserved by refrigeration to 4°C.

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111 Pfingsten Road
Northbrook, Illinois 60062
708.272.6520/Fax 708.498.2721

Sample Handling

Small representative portions of each sample were placed in clean sample jars for visual classification and water content tests. The remaining portions of each sample corresponding to the required five foot length were combined. Sediment samples were trimmed where necessary to eliminate sample overlap and excess core length from the prepared soil samples. Each five foot core was homogenized using a mechanical mixer and split into two samples for mechanical and chemical analysis.

The samples to undergo chemical analysis were placed into clean containers supplied by the subcontract laboratory and preserved by refrigeration to 4°C. Soil and background water samples were delivered to the subcontract laboratory. Samples which were used for the mechanical analysis samples were sealed in clean sample containers.

Soils Laboratory Analysis

The results of the visual classification and water content tests performed on each sample are presented on the boring logs included in Appendix A.

A particle size analysis was performed on each composite soil sample in accordance with the Illinois Environmental Protection Agency (IEPA) Water Quality Certification Section 401 Permit requirements. The results of this test are summarized on Table 1, and are reported as the percentage by weight passing the No. 230 U.S. sieve. In four samples (B-201, B-204, B-205, and B-206) the percent passing the No. 230 sieve exceeded 20%, which is the criteria used by the IEPA for additional chemical analysis requirements. The particle size laboratory results are included in Appendix B.

Chemical Laboratory Analysis

Supernatent tests were performed on each composite sample in accordance with 208(f) of Standard Methods for Water and Wastewater Analysis (14th ed., 1975). Fifteen compounds were measured after 0 and 15 minute settling periods in accordance with the scope of work outlined by the PWC. The results of these tests are summarized on Table 2. In addition, each composite sample was tested for total organic carbon, total solids, PCBs, and 14 polynuclear aromatic hydrocarbon compounds. These test results are summarized on Table 3. Detailed results are provided in the subcontract laboratory report included in Appendix C.

For comparison purposes, the IEPA measures supernatent test results against the levels specified in the Illinois Administrative Code, Title 35 - Environmental Protection; Subtitle C - Water Pollution; Chapter 1 - Pollution Control Board; Subparts B, C, and E to determine if the Lake Michigan water quality will be impacted adversely by the

addition of the sediment. Subparts B, C, and E list the maximum allowable concentrations of certain chemical constituents for general use water, public and food processing water supplies, and Lake Michigan water, respectively. Since test methods for these water quality standards have not been established, it should be noted that a direct correlation with supernatent test results is not advisable. Instead, the standards are used as a general guideline for purposes of comparison. Maximum allowable concentrations under the three subparts (as amended through May 4, 1989) for the constituents analyzed under the supernatent testing are shown on Table 2.

Results

As shown on Table 2, many of the metals tested in the supernatent analysis exceed the general use and public water quality standards, even after the 15 minute settling period. Many polynuclear aromatic hydrocarbon compounds were detected in each sample, although some of the lower concentrations may not be significant (as explained in Appendix C). One PCB compound was detected in sample B-204.

It is recommended that the PWC contact the IEPA and the United States Environmental Protection Agency (USEPA) to discuss the results and the feasibility of open water disposal of dredged material.

It has been a pleasure to work with you on this project. If you have any questions or comments, or need additional information, please feel free to call at (708) 272-6520.

Sincerely,

STS CONSULTANTS, LTD.

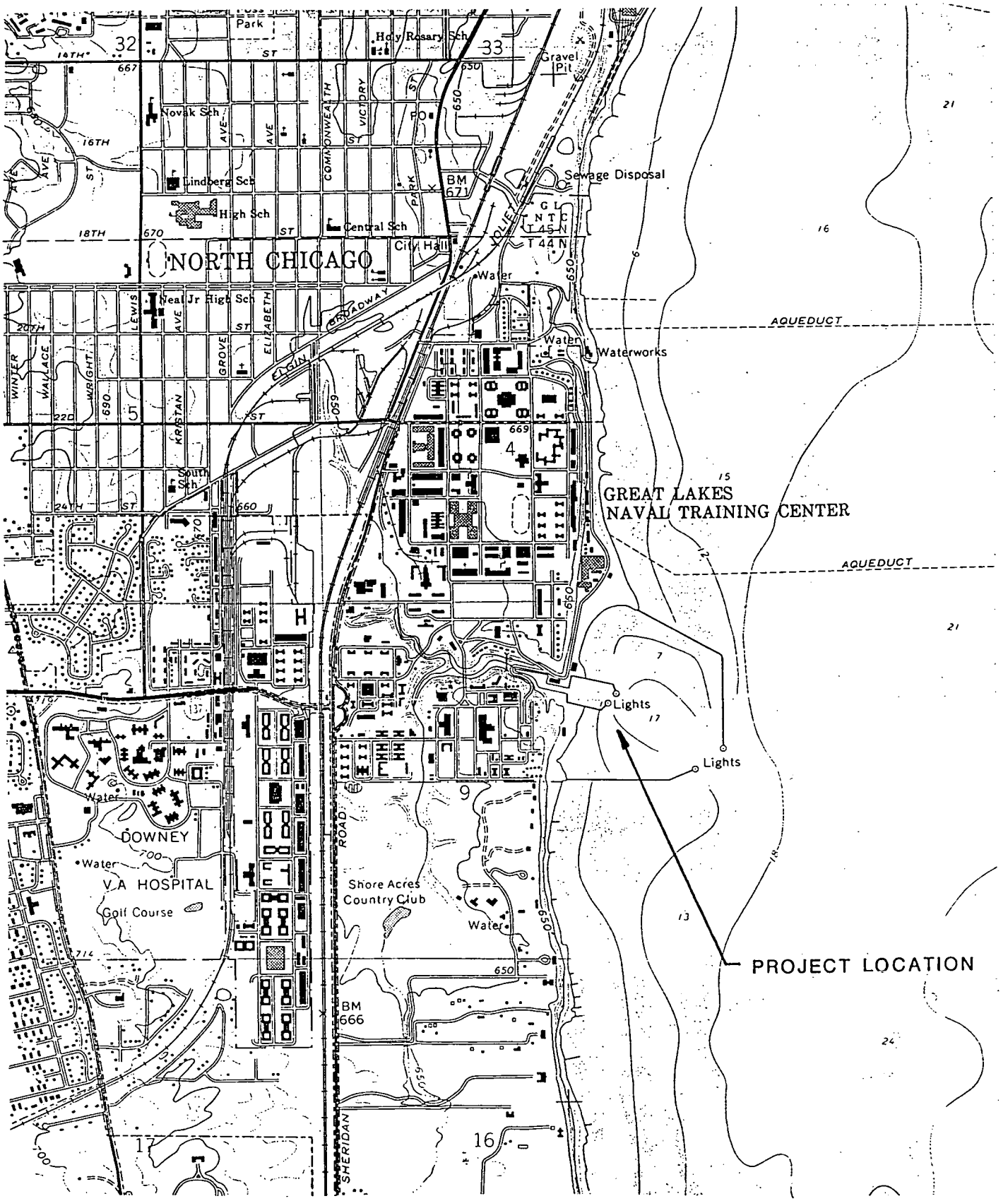
Linda M. Burke, P.E.
Senior Project Engineer

Andrew E. Haubert, P.E.
Principal Engineer

LMB/th

LMB98

STS Project No. 25123-XF



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PROJECT/CLIENT

VICINITY MAP

HARBOR MATERIAL ANALYSIS
GREAT LAKES NAVAL TRAINING CENTER

DRAWN BY		
CHECKED BY	MMW	
APPROVED BY	LMB	
SCALE 1"=2000'	FIGURE NO. 1	
STS DRAWING NO. 25123-XF		

Table 1

Harbor Material Analysis
Great Lakes Naval Training Center

Particle Size Distribution Test Results
Job Number 25123-XF

Sample ID	Percent (by weight) passing No. 230 U.S. sieve
B-201	58.8
B-202	5.5
B-203	16.6
B-204	72.9
B-205	95.0
B-206	55.2
B-207	17.3

Table 2

Harbor Material Analysis
Great Lakes Naval Training Center

Supernatent Test Results
Job Number 25123-XF

Parameter	Units	B-201		B-202		B-203		B-204	
		0 min	15 min	0 min	15 min	0 min	15 min	0 min	15 min
Silver	mg/l	0.304	0.248	0.043	0.034	0.069	0.067	0.390	0.429
Arsenic	ug/l	1098	1074	212	216	478	448	1560	2370
Beryllium	mg/l	0.05	0.04	ND	ND	0.04	0.04	0.10	0.10
Cadmium	mg/l	0.123	0.098	0.054	0.064	0.104	0.104	0.951	1.22
Total Cyanide	ug/l	ND	ND	104	93	81	74	1450	580
Chromium	mg/l	1.35	1.48	0.449	0.501	0.735	0.695	5.19	6.10
Hex. Chromium	mg/l	ND	ND	ND	ND	ND	ND	ND	ND
Copper	mg/l	3.91	3.85	4.73	5.12	9.12	9.24	59.9	85.1
Mercury	ug/l	ND	1.4	6.9	8.4	14.6	38.4	235.0	99.0
Nickel	mg/l	2.49	2.33	1.39	1.47	2.00	2.07	14.5	23.2
Lead	mg/l	5.7	5.4	3.3	3.7	11	11	68	50
Antimony	ug/l	ND	ND	3.0	2.3	8.0	6.5	43.5	70.2
Selenium	ug/l	18.0	14.8	8.2	9.3	17.9	25.2	138	147
Thallium	mg/l	1.8	1.23	ND	ND	0.2	0.19	1.12	1.24
Zinc	mg/l	9.92	11	16.4	18.3	35.0	35.2	137	195

Parameter	Units	B-205		B-206		B-207		Lake Michigan Water	Regulatory Limit and Subpart	
		0 min	15 min	0 min	15 min	0 min	15 min			
Silver	mg/l	0.441	0.062	0.362	0.098	0.108	0.017	ND	0.005	B
Arsenic	ug/l	2860	288	2990	786	538	118	ND	50	C
Beryllium	mg/l	0.06	0.03	0.07	0.03	0.04	ND	ND	NR	
Cadmium	mg/l	0.367	0.024	0.411	0.094	0.116	0.011	ND	0.01	C
Total Cyanide	ug/l	115	92	68	128	42	52	ND	25	B
Chromium	mg/l	6.72	1.57	4.72	1.49	0.910	0.218	ND	0.05	C
Hex. Chromium	mg/l	ND	ND	ND	ND	ND	ND	ND	0.05	B
Copper	mg/l	20.4	2.10	27.6	6.58	20.5	5.00	ND	0.02	B
Mercury	ug/l	30.2	5.2	17.8	7.4	2.1	1.8	ND	0.5	B
Nickel	mg/l	5.58	0.64	4.00	0.85	1.03	0.19	ND	1.0	B
Lead	mg/l	40	4.2	30	6.8	13	3.0	ND	0.05	C
Antimony	ug/l	5.2	ND	16.8	10.0	24.7	11.0	ND	NR	
Selenium	ug/l	93.0	8.4	48.0	8.2	9.9	ND	ND	0.01	C
Thallium	mg/l	1.46	ND	1.63	0.27	0.47	ND	ND	NR	
Zinc	mg/l	56.5	5.62	12.4	49.6	35.4	8.02	0.05	1.0	B

Note: "ND" denotes concentrations below detection limits.

"NR" denotes compounds not regulated under Subparts B, C, and E.

Table 3

Harbor Material Analysis
Great Lakes Naval Training Center

Chemical Test Results
Job Number 25123-XF

Parameter	Units	B-201	B-202	B-203	B-204	B-205	B-206	B-207
Total Organic Carbon	mg/kg	11900	1190	2530	12300	1570	13300	10700
Total Solids	%	81.4	80.9	79.6	63.0	59.5	73.9	82.0
PCB:								
PCB-1016	ug/kg	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ug/kg	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ug/kg	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ug/kg	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ug/kg	ND	ND	ND	ND	ND	ND	ND
PCB-1254	ug/kg	ND	ND	ND	2400	ND	ND	ND
PCB-1260	ug/kg	ND	ND	ND	ND	ND	ND	ND
PAH:								
Acenapthene	ug/kg	ND	ND	ND	ND	ND	ND	ND
Acenapthylene	ug/kg	ND	ND	ND	ND	ND	ND	ND
Anthracene	ug/kg	ND	ND	ND	ND	ND	ND	ND
Benz(a)anthracene	ug/kg	560	270	500	1100	180	740	550
Benzo(b)fluoranthene	ug/kg	570	260	540	740	200	260	620
Benzo(g,h,i)perylene	ug/kg	250	160	310	680	150	370	320
Benzo(a)pyrene	ug/kg	310	92	360	810	190	1300	360
Chrysene	ug/kg	620	360	670	1800	310	770	580
Dibenz(a,h)anthracene	ug/kg	98	55	110	260	47	170	110
Fluoranthrene	ug/kg	170	ND	170	450	ND	ND	130
Fluorene	ug/kg	120	ND	ND	266	ND	ND	ND
Indeno(1,2,3,cd)pyrene	ug/kg	780	630	190	704	720	250	800
Phenanthrene	ug/kg	850	410	770	2100	ND	650	600
Pyrene	ug/kg	830	450	970	2100	340	910	630

Note: "ND" denotes concentrations below detection limits.

A

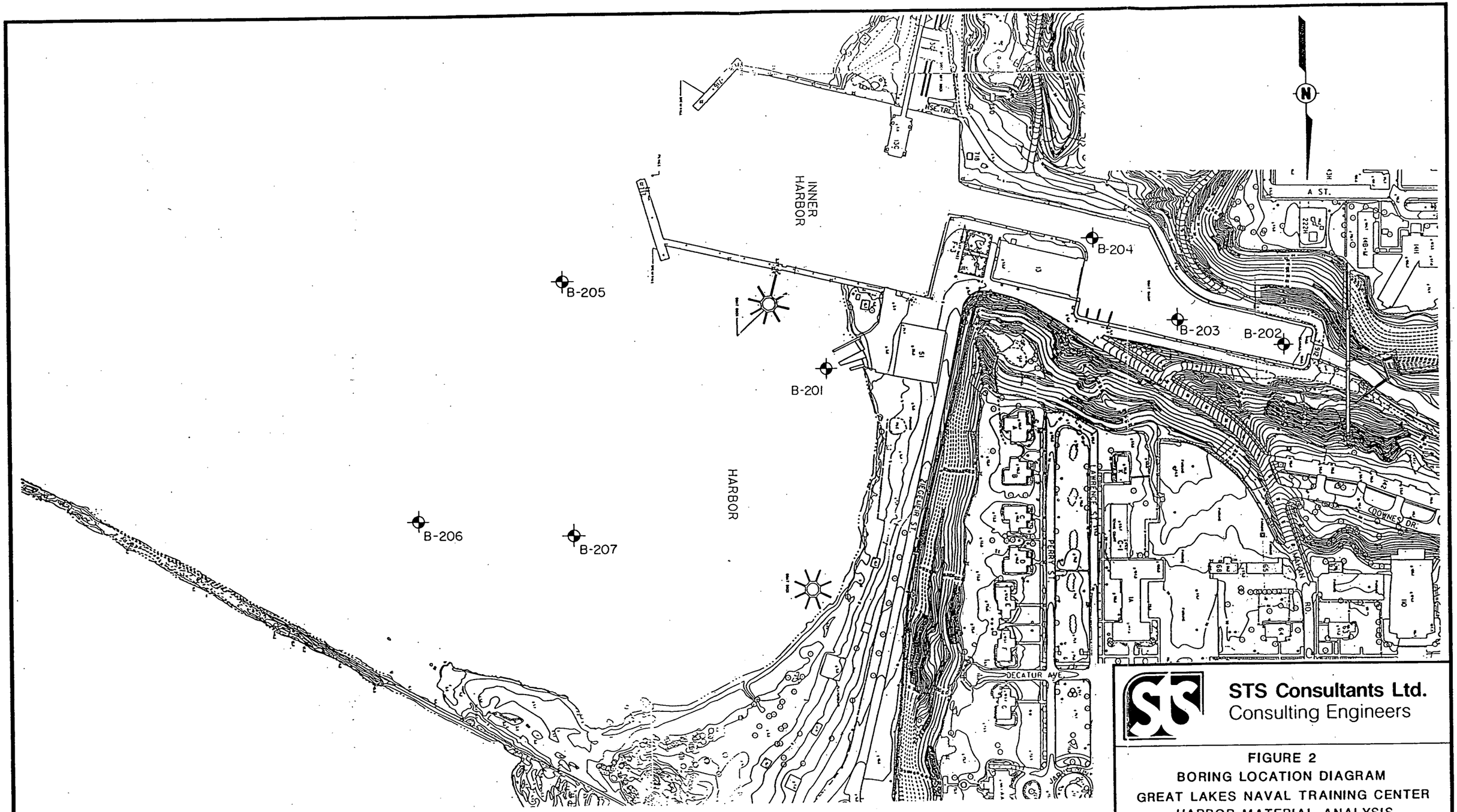

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FIGURE 2
BORING LOCATION DIAGRAM
GREAT LAKES NAVAL TRAINING CENTER
HARBOR MATERIAL ANALYSIS
GREAT LAKES, ILLINOIS

DRAWN BY	DATE	SCALE	STS PROJECT NO.
KKB	12-19-89	1"=200'	25123-XF
CHECKED BY	DATE	SHEET NO.	STS FILE NO.
LMB	12-19-89		25123-XF

STS Consultants Ltd.

OWNER: Great Lakes Naval Training Center	LOG OF BORING NUMBER: B-201
PROJECT NAME: Harbor Material Analysis	ARCHITECT-ENGINEER:

SITE LOCATION: Great Lakes, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² (1, 2, 3, 4, 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10, 20, 30, 40, 50)

STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50)

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.³
						SURFACE ELEVATION	
	2.5					Water	
5		1	OS			Fine to medium sand, trace silt - brownish gray - saturated (SP)	
7.5		2	OS			Silt - gray - saturated (ML)	
9.5		3	SS			Sandy silt - gray saturated (ML) Note: Sample 3 recovered from 7.4 to 9.5' at 2' offset	
						END OF BORING	

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

WL	WS OR WD	BORING STARTED: 12/6/89	STS OFFICE: Northbrook-01
WL BCR	ACR	BORING COMPLETED: 12/6/89	DRAWN BY: KKB / SHEET NO. 1 OF 1
WL		RIG: Tripod and Cathead / FOREMAN: Jack	APP'D BY: LMB/nt / STS JOB NO. 25123-XF

STS Consultants Ltd.

OWNER	LOG OF BORING NUMBER
Great Lakes Naval Training Center	B-202
PROJECT NAME	**ARCHITECT-ENGINEER**
Harbor Material Analysis	

SITE LOCATION

Great Lakes, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² (1 2 3 4 5)

PLASTIC LIMIT % | WATER CONTENT % | LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT. (10 20 30 40 50)

DEPTH (FT) / ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.³
SURFACE ELEVATION						
	1	Shovel			Fine to medium gravel, trace clay - gray - saturated (GP) Driller's observation: Some boulders (Material Frozen)	
2.5	2	ST			Silty fine to medium sand, trace gravel - gray - saturated (SM)	
5 5.5					END OF BORING	

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

WL WS OR WD	BORING STARTED 12/6/89	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 12/6/89	DRAWN BY KKB	SHEET NO. 1 OF 1
WL	RIG Tripod and cathead / FOREMAN Jack	APP'D BY LMB/nt	STS JOB NO. 25123-XF

STS Consultants Ltd.

OWNER: Great Lakes Naval Training Center	LOG OF BORING NUMBER: B-203
PROJECT NAME: Harbor Material Analysis	ARCHITECT-ENGINEER:

SITE LOCATION: Great Lakes, Illinois

DEPTH (FT) / ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.³
SURFACE ELEVATION						
	1	Shovel			Fine to medium sand, trace gravel and coarse sand - gray - saturated (SP)	
2.5	2	ST			Silty fine to medium sand, trace gravel - gray - saturated (SM)	
5						
6.5					END OF BORING	

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² (1 2 3 4 5)

PLASTIC LIMIT % × ---------- WATER CONTENT % ● ---------- LIQUID LIMIT % △ (10 20 30 40 50)

STANDARD PENETRATION BLOWS/FT. ⊗ (10 20 30 40 50)

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

WL WS OR WD	BORING STARTED 12/6/89	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 12/6/89	DRAWN BY KKB	SHEET NO. 1 OF 1
WL	RIG Tripod and Cathead / FOREMAN Jack	APP'D BY LMB/nt	STS JOB NO. 25123-XF

STS Consultants Ltd.

OWNER: Great Lakes Naval Training Center	LOG OF BORING NUMBER: B-204
PROJECT NAME: Harbor Material Analysis	ARCHITECT-ENGINEER:

SITE LOCATION: Great Lakes, Illinois

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT. (10 20 30 40 50)

DEPTH (FT) / ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.³
					SURFACE ELEVATION	
2.5					Water	
5.0	1	OS			Clayey silt - gray - saturated (ML) Note: Trace roots in sample 3	
7.5	2	OS				
10.0 / 10.3	3	OS				
					END OF BORING	

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

WL WS OR WD	BORING STARTED 12/5/89	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 12/5/89	DRAWN BY KKB	SHEET NO. 1 OF 1
WL	RIG Tripod and Cathead / FOREMAN Jack	APP'D BY LMB/nt	STS JOB NO. 25123-XF

STS Consultants Ltd.

OWNER: Great Lakes Naval Training Center	LOG OF BORING NUMBER: B-205
PROJECT NAME: Harbor Material Analysis	ARCHITECT-ENGINEER
SITE LOCATION: Great Lakes, Illinois	

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² (1 2 3 4 5)

PLASTIC LIMIT % × ---------- WATER CONTENT % ● ---------- LIQUID LIMIT % △ (10 20 30 40 50)

STANDARD PENETRATION ⊗ BLOWS/FT. (10 20 30 40 50)

DEPTH (FT) / ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.³
					SURFACE ELEVATION	
					Water	
2.5						
5						
7.5						
10						
12.5	1	OS			Clayey silt - gray - saturated (ML)	
15					Note: Sample 2 slightly organic	
	2	OS				
17.3					END OF BORING	

72.8

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

WL WS OR WD	BORING STARTED 12/5/89	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 12/5/89	DRAWN BY KKB	SHEET NO. 1 OF 1
WL	RIG Tripod and Cathead / FOREMAN Jack	APP'D BY LMB/nt	STS JOB NO. 25123-XF

STS Consultants Ltd.

OWNER: Great Lakes Naval Training Center	LOG OF BORING NUMBER: B-206
PROJECT NAME: Harbor Material Analysis	ARCHITECT-ENGINEER:

SITE LOCATION: Great Lakes, Illinois

DEPTH (FT) / ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
SURFACE ELEVATION						
					Water	
2.5						
5						
7.5						
10	1	ST			Silty fine sand - brownish gray - saturated (SM) Note: Sample 2 recovered from 11.5 to 14.0' at 2' offset	
12.5	2	OS				
14					END OF BORING	

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % × ---------- WATER CONTENT % ● ---------- LIQUID LIMIT % △

10 20 30 40 50

STANDARD PENETRATION ⊗ BLOWS/FT.: 10 20 30 40 50

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

WL WS OR WD	BORING STARTED 12/5/89	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 12/5/89	DRAWN BY KKB	SHEET NO. 1 OF 1
WL	RIG Tripod and Cathead / FOREMAN Jack	APP'D BY LMB/nt	STS JOB NO. 25123-XF

STS Consultants Ltd.

OWNER: Great Lakes Naval Training Center

PROJECT NAME: Harbor Material Analysis

LOG OF BORING NUMBER: B-207

ARCHITECT-ENGINEER:

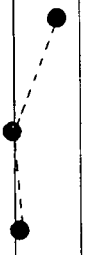
SITE LOCATION: Great Lakes, Illinois

DEPTH (FT) / ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.³
SURFACE ELEVATION						
2.5					Water	
5						
7.5	1	OS			Fine sand - brownish gray - saturated (SP)	
10	2	OS				
12.5	3	SS				
					END OF BORING	

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/FT. (10 20 30 40 50)



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

WL WS OR WD	BORING STARTED 12/5/89	STS OFFICE Northbrook-01	
WL BCR ACR	BORING COMPLETED 12/5/89	DRAWN BY KKB	SHEET NO. 1 OF 1
WL	RIG Tripod and Cathead / FOREMAN Jack	APP'D BY LMB/nt	STS JOB NO. 25123-XF

B

MATERIAL ANALYSIS FOR DREDGE AND FILL ACTIVITIES
For Section 401 Water Quality Certification
From the Illinois Environmental Protection Agency

STS CONSULTANTS, LTD.

GRAIN SIZE DISTRIBUTION (ASTM D 422)

Project : GREAT LAKES TRAINING CENTER
Boring/Source: B-201
Sampl Number: S1-S3
Depth (feet): 4-9
USCS Classification: --
Soil Description : SANDY SILT-GRAY

STS Job No. : 25123-XF
Date : 12-12-89
LL: - PL: - PI: -
WC: - SP.GR.: -

SIEVE ANALYSIS --

SAMPLE WEIGHT: 25.00 GRAMS

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
#230	10.29	41.16	58.84

MATERIAL ANALYSIS FOR DREDGE AND FILL ACTIVITIES
For Section 401 Water Quality Certification
From the Illinois Environmental Protection Agency

STS CONSULTANTS, LTD.

GRAIN SIZE DISTRIBUTION (ASTM D 422)

Project : GREAT LAKES TRAINING CENTER
Boring/Source: B-202
Sample Number: S1,S2
Depth (feet): 0-5
USCS Classification: --
Soil Description : F-C SAND AND SLAG,TRACE SILT SIZES-GRAY

STS Job No. : 25123-XF
Date : 12-12-89
LL: - PL: - PI: -
WC: - SP.GR.: -

SIEVE ANALYSIS --

SAMPLE WEIGHT: 25.00 GRAMS

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
#230	23.62	94.48	5.52

MATERIAL ANALYSIS FOR DREDGE AND FILL ACTIVITIES
For Section 401 Water Quality Certification
From the Illinois Environmental Protection Agency

STS CONSULTANTS, LTD.

GRAIN SIZE DISTRIBUTION (ASTM D 422)

Project : GREAT LAKES TRAINING CENTER
Boring/Source: B-203
Sample Number: S1,S2
Depth (feet): 0-5
USCS Classification: --
Soil Description : F-C SAND,LITTLE SILT SIZES-GRAY

STS Job No. : 25123-XF
Date : 12-12-89
LL: - PL: - PI: -
WC: - SP.GR.: -

SIEVE ANALYSIS --

SAMPLE WEIGHT: 25.11 GRAMS

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
#230	20.95	83.43	16.57

MATERIAL ANALYSIS FOR DREDGE AND FILL ACTIVITIES
For Section 401 Water Quality Certification
From the Illinois Environmental Protection Agency

STS CONSULTANTS, LTD.

GRAIN SIZE DISTRIBUTION (ASTM D 422)

Project : GREAT LAKES TRAINING CENTER
Boring/Source: B-204
Sample Number: S1-S3
Depth (feet): 3.3-8.3
USCS Classification: --
Soil Description : SANDY SILT-GRAY

STS Job No. : 25123-XF
Date : 12-12-89
LL: - PL: - PI: -
WC: - SP.GR.: -

SIEVE ANALYSIS --

SAMPLE WEIGHT: 25.10 GRAMS

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
#230	6.80	27.09	72.91

MATERIAL ANALYSIS FOR DREDGE AND FILL ACTIVITIES
For Section 401 Water Quality Certification
From the Illinois Environmental Protection Agency

STS CONSULTANTS, LTD.

GRAIN SIZE DISTRIBUTION (ASTM D 422)

Project : GREAT LAKES TRAINING CENTER
Boring/Source: B-205
Sampl Number: S1,S2
Depth (feet): 12.3-17.3
USCS Classification: --
Soil Description : SILT,TRACE F SAND-GRAY

STS Job No. : 25123-XF
Date : 12-12-89
LL: - PL: - PI: -
WC: - SP.GR.: -

SIEVE ANALYSIS --

SAMPLE WEIGHT: 25.06 GRAMS

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
#230	1.26	5.03	94.97

MATERIAL ANALYSIS FOR DREDGE AND FILL ACTIVITIES
For Section 401 Water Quality Certification
From the Illinois Environmental Protection Agency

STS CONSULTANTS, LTD.

GRAIN SIZE DISTRIBUTION (ASTM D 422)

Project : GREAT LAKES TRAINING CENTER
Boring/Source: B-206
Sample Number: S1,S2
Depth (feet): 7.8-12.8
USCS Classification: --
Soil Description : F SANDY SILT-GRAY

STS Job No. : 25123-XF
Date : 12-12-89
LL: - PL: - PI: -
WC: - SP.GR.: -

SIEVE ANALYSIS --

SAMPLE WEIGHT: 25.26 GRAMS

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
#230	11.32	44.81	55.19

MATERIAL ANALYSIS FOR DREDGE AND FILL ACTIVITIES
For Section 401 Water Quality Certification
From the Illinois Environmental Protection Agency

STS CONSULTANTS, LTD.

GRAIN SIZE DISTRIBUTION (ASTM D 422)

Project : GREAT LAKES TRAINING CENTER
Boring/Source: B-207
Sample Number: S1-S3
Depth (feet): 6.9-11.9
USCS Classification: --
Soil Description : F SAND,LITTLE SILT-GRAY

STS Job No. : 25123-XF
Date : 12-12-89
LL: - PL: - PI: -
WC: - SP.GR.: -

SIEVE ANALYSIS --

SAMPLE WEIGHT: 25.22 GRAMS

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
#230	20.87	82.75	17.25

C

RADIAN
CORPORATION

Radian Work Order 89-12-058

Analytical Report
12/28/89

STS CONSULTANTS LTD

STS CONSULTANTS LTD
RADIAN - MILWAUKEE
5103 W. BELOIT ROAD
MILWAUKEE, WI. 53214
C. APPLEGATE,cc J.WOJTKIEWICZ

Customer Work Identification Elutriate and Sediment
Purchase Order Number 393-001-13-01

Contents:

Radian Analytical Services
8501 Mo-Pac Boulevard
P. O. Box 201088
Austin, TX 78720-1088

512/454-4797

Client Services Coordinator: LABENDELE

Certified by: Marilyn Melton

Previously Reported on 12/22/89.

STS CONSULTANTS LTD
Radian Work Order: 89-12-058

Method:SW8080-Pesticides/PCBs (1)
List:8080PC/PE MATRIX SPIKE

Sample ID:	B-207 MS	B-207 MSD
Factor:	199	196
Results in:	%	%
	08B	09B
Matrix:	solid	solid
Aldrin	118 D	116 D
gamma-BHC	82 D	79 D
4,4'-DDT	108	103
Dieldrin	89	84
Endrin	96	92
Heptachlor	208 DQ	139 DQ
Surrogate Recovery(%)		
Dibutylchlorendate	105	108
Control Limits: 20 to 150		
2,4,5,6-Tetrachloro-m-xylene	201DQ	218DQ
Control Limits: 17 to 152		

D Sample diluted for this analyte

Q Outside control limits

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

STS CONSULTANTS LTD
Radian Work Order: 89-12-058

Method:SW8080-Pesticides/PCBs (1)
List:8080 LIST FOR PCB'S-SOLIDS

Sample ID:	B-201	B-202	B-203	B-204	B-205	B-206
Factor:	500	495	497	1000	488	976
Results in:	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
	01B	02B	03B	04B	05B	06B
Matrix:	solid	solid	solid	solid	solid	solid
PCB-1016	<50	<50	<50	<100	<49	<98
PCB-1221	<100	<99	<99	<200	<98	<200
PCB-1232	<100	<99	<99	<200	<98	<200
PCB-1242	<50	<50	<50	<100	<49	<98
PCB-1248	<50	<50	<50	<100	<49	<98
PCB-1254	<100	<99	<99	2400	<98	<200
PCB-1260	<100	<99	<99	<200	<98	<200
Surrogate Recovery(%)						
Dibutylchlorendate	545 Q	98	538 Q	288 Q	113	110D
Control Limits: 20 to 150						
2,4,5,6-Tetrachloro-m-xylene	224 Q	310DQ	186 Q	234 Q	640DQ	417 Q
Control Limits: 17 to 152						

Q Outside control limits

D Sample diluted for this analyte

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

STS CONSULTANTS LTD
Radian Work Order: 89-12-058

Method:SW8080-Pesticides/PCBs (1)
List:8080 LIST FOR PCB'S-SOLIDS

Sample ID:	B-207	REAGENT BLANK
Factor:	497	100
Results in:	ug/Kg	ug/Kg
	07B	12A
Matrix:	solid	solid
PCB-1016	<50	<10
PCB-1221	<99	<20
PCB-1232	<99	<20
PCB-1242	<50	<10
PCB-1248	<50	<10
PCB-1254	<99	<20
PCB-1260	<99	<20
Surrogate Recovery(%)		
Dibutylchlorendate	95	112
Control Limits: 20 to 150		
2,4,5,6-Tetrachloro-m-xylene	203 Q	95
Control Limits: 17 to 152		

Q Outside control limits

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

STS CONSULTANTS LTD
Radian Work Order: 89-12-058

Method:SW8310-PAH's by HPLC (1)
List:8310 Method analytes

Sample ID:	B-201	B-202	B-203	B-204	B-205	B-206
Factor:	500	500	500	2500	490	2500
Results in:	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
	01A	02A	03A	04A	05A	06A
Matrix:	solid	solid	solid	solid	solid	solid
Acenaphthalene	<1200	<1200	<1200	<5800	<1200	<5800
Acenaphthene	<900	<900	<900	<4500	<900	<4500
Anthracene	<330	<330	<330	<1700	<330	<1700
Benzo(a)anthracene	560	270	500	1100	180	740
Benzo(a)pyrene	310 D	92 *D	360	810	190	1300
Benzo(b)fluoranthene	570	260	540	740	200	260
Benzo(g,h,i)perylene	250	160 *	310	680 *	150 *	370 *
Benzo(k)fluoranthene	NR	NR	NR	NR	NR	NR
Chrysene	620	360	670	1800	310	770
Dibenzo(a,h)anthracene	98	55 *	110	260 *	47 *	170 *
Fluoranthene	170 *	<110	170 *	450 *D	<110	<530
Fluorene	120 *	<110	<110	266 *D	<110	<530
Indeno(1,2,3-cd)pyrene	780	630	190	704 D	720	250 D
Naphthalene	NR	NR	NR	NR	NR	NR
Phenanthrene	850 *	410 *	770 *	2100 *D	<320	650 *D
Pyrene	830	450 *	970	2100 *	340 *	910 *
Surrogate Recovery(%)						
Terphenyl-d14	68	78	58	NC	28	119 D
Control Limits: 0 to 180						

D Sample diluted for this analyte
* Est. result less than 5 times detection limit
NR Analyte not requested
NC Not calculated

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

STS CONSULTANTS LTD
Radian Work Order: 89-12-058

Method:SW8310-PAH's by HPLC (1)
List:8310 Method analytes

Sample ID:	B-207	REAGENT BLANK
Factor:	490	100
Results in:	ug/Kg	ug/Kg
	07A	11A
Matrix:	solid	solid
Acenaphthalene	<1100	<230
Acenaphthene	<880	<180
Anthracene	<320	<66
Benzo(a)anthracene	550	<1.3
Benzo(a)pyrene	360	<2.3
Benzo(b)fluoranthene	620	<1.8
Benzo(g,h,i)perylene	320	<7.6
Benzo(k)fluoranthene	NR	NR
Chrysene	580	<1.3
Dibenzo(a,h)anthracene	110	<3.0
Fluoranthene	130 *	<21
Fluorene	<100	<21
Indeno(1,2,3-cd)pyrene	800	<4.3
Naphthalene	NR	NR
Phenanthrene	600 *	<64
Pyrene	630 *	<27
Surrogate Recovery(%)		
Terphenyl-d14	80	63
Control Limits: 0 to 180		

NR Analyte not requested

* Est. result less than 5 times detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

STS CONSULTANTS LTD
Radian Work Order: 89-12-058

Method:SW8310-PAH's by HPLC (1)
List:Matrix Spike Analyte List

Sample ID:	B-207 MS	B-207 MSD	RECOVERY CHECK
Factor:	1	1	1
Results in:	%	%	%
	08A	09A	10A
Matrix:	solid	solid	solid
Acenaphthalene	48	41	78
Acenaphthene	44	45	76
Anthracene	53	48	84
Benzo(k)fluoranthene	52	35	92
Dibenzo(a,h)anthracene	40	25	87
Fluorene	35	28	81
Naphthalene	10	4	76
Phenanthrene	56	50	82
Surrogate Recovery(%)			
Terphenyl-d14	69	NC	83
Control Limits: 0 to 180			

NC Not calculated

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

STS CONSULTANTS LTD
Radian Work Order: 89-12-058

Sample Identifications and Dates

Sample ID	B-201	B-202	B-203	B-204	B-205	B-206
Date Sampled	12/06/89	12/06/89	12/06/89	12/05/89	12/05/89	12/05/89
Date Received	12/08/89	12/08/89	12/08/89	12/08/89	12/08/89	12/08/89
Matrix	solid	solid	solid	solid	solid	solid
	01	02	03	04	05	06
SW8080-Pesticides/PCBs						
Prepared	12/08/89	12/08/89	12/08/89	12/08/89	12/08/89	12/08/89
Analyzed	12/12/89	12/12/89	12/12/89	12/13/89	12/13/89	12/12/89
Analyst	REM	REM	REM	REM	REM	REM
File ID	HP422	HP411	HP412	HP425	HP426	HP415
Blank ID	HP44	HP44	HP44	HP44	HP44	HP44
Instrument	HP4	HP4	HP4	HP4	HP4	HP4
Report as	received	received	received	received	received	received
SW8310-PAH's by HPLC						
Prepared	12/08/89	12/08/89	12/08/89	12/08/89	12/08/89	12/08/89
Analyzed	12/20/89	12/20/89	12/20/89	12/20/89	12/20/89	12/20/89
Analyst	TLS	TLS	TLS	TLS	TLS	TLS
File ID	311	314	315	338	317	339
Blank ID	322	322	322	322	322	322
Instrument	HPLC 2	HPLC 2	HPLC 2	HPLC 2	HPLC 2	HPLC 2
Report as	received	received	received	received	received	received

STS CONSULTANTS LTD.
Radian Work Order: 89-12-058

Sample Identifications and Dates

Sample ID	B-207	B-207 MS	B-207 MSD	RECOVERY CHECK	REAGENT BLANK	REAGENT BLANK
Date Sampled	12/05/89					
Date Received	12/08/89	12/08/89	12/08/89	12/08/89	12/08/89	12/08/89
Matrix	solid	solid	solid	solid	solid	solid
	07	08	09	10	11	12
SW8080-Pesticides/PCBs						
Prepared		12/08/89	12/08/89			
Analyzed		12/12/89	12/12/89			
Analyst		REM	REM			
File ID		HP46	HP47			
Blank ID		HP44	HP44			
Instrument		HP4	HP4			
Report as		received	received			
SW8080-Pesticides/PCBs						
Prepared	12/08/89					12/08/89
Analyzed	12/12/89					12/12/89
Analyst	REM					REM
File ID	HP421					HP44
Blank ID	HP44					HP44
Instrument	HP4					HP4
Report as	received					received
SW8310-PAH's by HPLC						
Prepared	12/08/89				12/08/89	
Analyzed	12/20/89				12/21/89	
Analyst	TLS				TLS	
File ID	319				322	
Blank ID	322				322	
Instrument	HPLC 2				HPLC 2	
Report as	received				received	
SW8310-PAH's by HPLC						
Prepared		12/08/89	12/08/89	12/08/89		
Analyzed		12/20/89	12/20/89	12/20/89		
Analyst		TLS	TLS	TLS		
File ID		312	313	323		
Blank ID		322	322	322		
Instrument		HPLC 2	HPLC 2	HPLC 2		
Report as		received	received	received		

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Appendix A

Comments, Notes and Definitions

RADIAN CORPORATION

STS CONSULTANTS LTD
Radian Work Order: 89-12-058

General Comments
8080-Unable to identify low-level PCBs due to matrix interference
Surrogates display high % recoveries due to matrix interference

STS CONSULTANTS LTD
Radian Work Order: 89-12-058

A This flag indicates that a spike is an analytical and/or post-digestion spike. These spikes have not been subjected to the extraction or digestion step.

B This flag indicates that the analyte was detected in the reagent blank but the sample results are not corrected for the amount in the blank.

C Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation. The C flag indicates that the analyte has been confirmed by analysis on a second column.

D This flag identifies all analytes identified in analysis at a secondary dilution factor. In an analysis some compounds can exceed the calibration range of the instrument. Therefore two analyses are performed,one at the concentration of the majority of the analytes, and a second with the sample diluted so that high concentration analyte(s) fall within the calibration range.

E The reported value is estimated because of the presence of interference. The potential source of the interference is included in the report narrative.

G This flag identifies a GC/MS result whose concentration exceeds the calibration range for that specific analysis. Usually if one or more compounds have a response greater than full scale, the sample or extract is diluted and re-analyzed.

I This is a general purpose flag for those situations not covered by the standard flags. The specific definition of this flag is described in the Comments Summary or supplemental case narrative with the report.

J Indicates an estimated value for GC/MS data. This flag is used either when estimating a concentration for tentatively identified compounds where a response factor of 1 is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit.

NA This analyte was not analyzed.

NC Applies to RPD and spike recovery results. The relative percent difference (RPD) and spike recovery are not calculated when a result value is less than five times the detection limit or obvious matrix interferences are present. See * definition for further explanation of the unreliability of data near the detection limit. A spike recovery is not calculated when the sample result is greater than four times the spike added concentration because the spike added concentration is considered insignificant.

STS CONSULTANTS LTD
Radian Work Order: 89-12-058

ND This flag (or <) is used to denote analytes which are not detected at or above the specified detection limit. The value to the right of the < symbol is the method specified detection limit for the sample.

NR This analyte was not requested by the client.

NS This analyte or surrogate was not added (spiked) to the sample for this analysis.

N\A A result or value is not available for this parameter, usually a detection limit.

P Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation. The P flag indicates that the analyte has been confirmed previously. This flag is applicable to analyses of samples arising from a regular sampling program as a specific sample source; for example, a quarterly well monitoring program.

Q This quality control standard is outside method or laboratory specified control limits. This flag is applied to matrix spike, analytical QC spike, and surrogate recoveries; and to RPD(relative percent difference) values for duplicate analyses and matrix spike/matrix spike duplicate result.

R This flag indicates that the analyte was detected in the reagent blank and the sample results are corrected for the amount in the blank.

S This flag indicates that a specific result from a metals analysis has been obtained using the Method of Standard Addition.

U Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation. The U flag indicates that second column was not requested.

X Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation. The X flag indicates a second column confirmation was performed but the analyte was not confirmed and is likely a false positive.

* The asterisk(*) is used to flag results which are less than five times the method specified detection limit. Studies have shown that the uncertainty of the analysis will increase exponentially as the method detection limit is approached. These results should be considered approximate.

STS CONSULTANTS LTD
Radian Work Order: 89-12-058

TERMS USED IN THIS REPORT:

Analyte - A chemical for which a sample is to be analyzed. The analysis will meet EPA method and QC specifications.

Compound - See Analyte.

Detection Limit - The method specified detection limit, which is the lower limit of quantitation specified by EPA for a method. Radian staff regularly assess their laboratories' method detection limits to verify that they meet or are lower than those specified by EPA. Detection limits which are higher than method limits are based on experimental values at the 99% confidence level. Note, the detection limit may vary from that specified by EPA based on sample size, dilution or cleanup. (Refer to Factor, below)

EPA Method - The EPA specified method used to perform an analysis. EPA has specified standard methods for analysis of environmental samples. Radian will perform its analyses and accompanying QC tests in conformance with EPA methods unless otherwise specified.

Factor - Default method detection limits are based on analysis of clean water samples. A factor is required to calculate sample specific detection limits based on alternate matrices (soil or water), use of cleanup procedures, or dilution of extracts/ digestates. For example, extraction or digestion of 10 grams of soil in contrast to 1 liter of water will result in a factor of 100.

Matrix - The sample material. Generally, it will be soil, water, air, oil, or solid waste.

Radian Work Order - The unique Radian identification code assigned to the samples reported in the analytical summary.

Units -	ug/L	micrograms per liter (parts per billion);liquids/water
	ug/Kg	micrograms per kilogram (parts per billion); soils/solids
	ug/M3	micrograms per cubic meter; air samples
	mg/L	milligrams per liter (parts per million);liquids/water
	mg/Kg	milligrams per kilogram (parts per million);soils/solids
	%	percent; usually used for percent recovery of QC standards
	uS/cm	conductance unit; microSiemans/centimeter
	mL/hr	milliliters per hour; rate of settlement of matter in water
	NTU	turbidity unit; nephelometric turbidity unit
	CU	color unit; equal to 1 mg/L of chloroplatinate salt

RADIAN CORPORATION

Radian Work Order 89-12-162

Analytical Report
12/28/89

STS CONSULTANTS LTD

STS CONSULTANTS LTD
RADIAN - MILWAUKEE
5103 W. BELOIT ROAD
MILWAUKEE, WI. 53214
C. APPLEGATE,cc J.WOJTKIEWICZ

Customer Work Identification Elutriate and Sediment
Purchase Order Number 393-001-13-01

Contents:

Radian Analytical Services
8501 Mo-Pac Boulevard
P. O. Box 201088
Austin, TX 78720-1088

512/454-4797

Client Services Coordinator: LABENDELE

Certified by:

STS CONSULTANTS LTD
Radian Work Order: 89-12-162

Method/Analyte	Sample Identifications				
	B-201	B-202	B-203	B-204	B-205
	01	02	03	04	05
Matrix	soil	soil	soil	soil	soil
Percent moisture					
Percent moisture	18.6 %	19.1 %	20.4 %	37.0 %	40.5 %

For a detailed description of flags and technical terms in this report refer to the glossary.

STS CONSULTANTS LTD
Radian Work Order: 89-12-162

Method/Analyte	Sample Identifications					
	B-206		B-207			
	06		07			
Matrix	soil		soil			
Percent moisture						
Percent moisture	26.1	%	18.0	%		

For a detailed description of flags and technical terms in this report refer to the glossary.

STS CONSULTANTS LTD
Radian Work Order: 89-12-162

Sample Identifications and Dates

Sample ID	B-201	B-202	B-203	B-204	B-205	B-206
Date Sampled	12/06/89	12/06/89	12/06/89	12/05/89	12/05/89	12/05/89
Date Received	12/08/89	12/08/89	12/08/89	12/08/89	12/08/89	12/08/89
Matrix	soil	soil	soil	soil	soil	soil
	01	02	03	04	05	06
Percent moisture						
Prepared	12/21/89	12/21/89	12/21/89	12/21/89	12/21/89	12/21/89
Analyzed	12/21/89	12/21/89	12/21/89	12/21/89	12/21/89	12/21/89
Analyst	ET	ET	ET	ET	ET	ET
File ID						
Blank ID						
Instrument						
Report as	received	received	received	received	received	received

STS CONSULTANTS LTD
Radian Work Order: 89-12-162

Sample Identifications and Dates

Sample ID	B-207					
Date Sampled	12/05/89					
Date Received	12/08/89					
Matrix	soil					
	07					
Percent moisture						
Prepared	12/21/89					
Analyzed	12/21/89					
Analyst	ET					
File ID						
Blank ID						
Instrument						
Report as	received					

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CORPORATION

Appendix A

Comments, Notes and Definitions

STS CONSULTANTS LTD
Radian Work Order: 89-12-162

A This flag indicates that a spike is an analytical and/or post-digestion spike. These spikes have not been subjected to the extraction or digestion step.

B This flag indicates that the analyte was detected in the reagent blank but the sample results are not corrected for the amount in the blank.

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E The reported value is estimated because of the presence of interference. The potential source of the interference is included in the report narrative.

G This flag identifies a GC/MS result whose concentration exceeds the calibration range for that specific analysis. Usually if one or more compounds have a response greater than full scale, the sample or extract is diluted and re-analyzed.

I This is a general purpose flag for those situations not covered by the standard flags. The specific definition of this flag is described in the Comments Summary or supplemental case narrative with the report.

J Indicates an estimated value for GC/MS data. This flag is used either when estimating a concentration for tentatively identified compounds where a response factor of 1 is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit.

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NC Applies to RPD and spike recovery results. The relative percent difference (RPD) and spike recovery are not calculated when a result value is less than five times the detection limit or obvious matrix interferences are present. See * definition for further explanation of the unreliability of data near the detection limit. A spike recovery is not calculated when the sample result is greater than four times the spike added concentration because the spike added concentration is considered insignificant.

STS CONSULTANTS LTD
Radian Work Order: 89-12-162

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N\A A result or value is not available for this parameter, usually a detection limit.

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Q This quality control standard is outside method or laboratory specified control limits. This flag is applied to matrix spike, analytical QC spike, and surrogate recoveries; and to RPD(relative percent difference) values for duplicate analyses and matrix spike/matrix spike duplicate result.

R This flag indicates that the analyte was detected in the reagent blank and the sample results are corrected for the amount in the blank.

S This flag indicates that a specific result from a metals analysis has been obtained using the Method of Standard Addition.

U Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation. The U flag indicates that second column was not requested.

X Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation. The X flag indicates a second column confirmation was performed but the analyte was not confirmed and is likely a false positive.

* The asterisk(*) is used to flag results which are less than five times the method specified detection limit. Studies have shown that the uncertainty of the analysis will increase exponentially as the method detection limit is approached. These results should be considered approximate.

STS CONSULTANTS LTD
Radian Work Order: 89-12-162

TERMS USED IN THIS REPORT:

Analyte - A chemical for which a sample is to be analyzed. The analysis will meet EPA method and QC specifications.

Compound - See Analyte.

Detection Limit - The method specified detection limit, which is the lower limit of quantitation specified by EPA for a method. Radian staff regularly assess their laboratories' method detection limits to verify that they meet or are lower than those specified by EPA. Detection limits which are higher than method limits are based on experimental values at the 99% confidence level. Note, the detection limit may vary from that specified by EPA based on sample size, dilution or cleanup. (Refer to Factor, below)

EPA Method - The EPA specified method used to perform an analysis. EPA has specified standard methods for analysis of environmental samples. Radian will perform its analyses and accompanying QC tests in conformance with EPA methods unless otherwise specified.

Factor - Default method detection limits are based on analysis of clean water samples. A factor is required to calculate sample specific detection limits based on alternate matrices (soil or water), use of cleanup procedures, or dilution of extracts/ digestates. For example, extraction or digestion of 10 grams of soil in contrast to 1 liter of water will result in a factor of 100.

Matrix - The sample material. Generally, it will be soil, water, air, oil, or solid waste.

Radian Work Order - The unique Radian identification code assigned to the samples reported in the analytical summary.

Units -	ug/L	micrograms per liter (parts per billion);liquids/water
	ug/Kg	micrograms per kilogram (parts per billion); soils/solids
	ug/M3	micrograms per cubic meter; air samples
	mg/L	milligrams per liter (parts per million);liquids/water
	mg/Kg	milligrams per kilogram (parts per million);soils/solids
	%	percent; usually used for percent recovery of QC standards
	uS/cm	conductance unit; microSiemans/centimeter
	mL/hr	milliliters per hour; rate of settlement of matter in water
	NTU	turbidity unit; nephelometric turbidity unit
	CU	color unit; equal to 1 mg/L of chloroplatinate salt

Received: 12/07/89

RADIAN CORP. REPORT
12/28/89 10:25:17

Work Order # M9-12-017

REPORT TO
STS CONSULTANTS, LTD
111 PFINGSTON ROAD
NORTHBROOK, ILLINOIS 60062

ATTEN MR. PAUL BLINDAUER

CLIENT STS_NORTHBRK SAMPLES 12
COMPANY STS CONSULTANTS, LTD
FACILITY 111 PFINGSTON ROAD
NORTHBROOK, ILLINOIS 60062

WORK ID ELUTRIATE & SEDIMENT
TAKEN T. MULVEY-RADIAN COC M1491
TRANS
TYPE SLURRY
P.O. # 25123XE
INVOICE under separate cover

PREPARED BY
Radian Corporation
Milwaukee Office
5103 West Beloit Road
Milwaukee, WI 53214
ATTEN Charles S. Applegate
PHONE (414)643-2768

James R. Hatz
CERTIFIED BY

CONTACT C_APPLEGATE

State of Wisconsin - Certified Laboratory
No. 241293910

REFER TO END OF REPORT FOR EXPLANATION OF PROBLEM AREAS AND ASSOCIATED FLAGS.

SAMPLE IDENTIFICATION

01	B-201 TIME 0 SLURRY
02	B-201 TIME 15 SLURRY
03	B-201 SEDIMENT
04	B-202 TIME 0
05	B-202 TIME 15 SLURRY
06	B-202 SEDIMENT
07	B-203 TIME 0 SLURRY
08	B-203 TIME 15 SLURRY
09	B-203 SEDIMENT
10	B-204 TIME 0 SLURRY
11	B-204 TIME 15 SLURRY
12	B-204 SEDIMENT

TEST CODES and NAMES used on this report

AG	SILVER
AS_HY	ARSENIC BY HYDRIDE GEN.
BE	BERYLLIUM
CD	CADMIUM
CN	TOTAL CYANIDE
CR	CHROMIUM
CR_HEX	CHROMIUM-HEXAVALENT
CU	COPPER
HG	MERCURY
NI	NICKEL
PB	LEAD
SB	ANTIMONY
SE_HY	SELENIUM BY HYDRIDE GEN.
TL	THALLIUM
TOC_S	TOTAL ORGANIC CARBON SOIL
ZN	ZINC

SAMPLE ID **B-201 TIME 0 SLURRY** SAMPLE # **01** FRACTIONS: **A,B,C,D**
Date & Time Collected **12/08/89 12:00:00** Category

AG	**0.304 E** mg/L	**AS_HY**	**1098 S** ug/L	**BE**	**0.05** mg/L	**CD**	**0.123** mg/L	**CN**	**N\A** ug/L	**CR**	**1.35** mg/L
CR_HEX	**<0.001** mg/L	**CU**	**3.91** mg/L	**HG**	**<0.4** ug/L	**NI**	**2.49** mg/L	**PB**	**5.7** mg/L	**SB**	**<1 S** ug/L
SE_HY	**18.0** ug/L	**TL**	**1.80** mg/L	**ZN**	**9.92** mg/L						

SAMPLE ID **B-201 TIME 15 SLURRY** SAMPLE # **02** FRACTIONS: **A,B,C,D**
Date & Time Collected **12/08/89 12:00:00** Category

AG	**0.248 E** mg/L	**AS_HY**	**1074 S** ug/L	**BE**	**0.04** mg/L	**CD**	0.098 mg/L	**CN**	<10 ug/L	**CR**	1.48 mg/L
CR_HEX	**<0.001** mg/L	**CU**	**3.85** mg/L	**HG**	**1.4** ug/L	**NI**	2.33 mg/L	**PB**	5.4 mg/L	**SB**	<1 S ug/L
SE_HY	**14.8 S** ug/L	**TL**	**1.23** mg/L	**ZN**	**11.0** mg/L						

SAMPLE ID **B-201 SEDIMENT** SAMPLE # **03** FRACTIONS: **A**
Date & Time Collected **12/06/89** Category

TOC_S	**11900** mg/Kg

SAMPLE ID **B-202 TIME 0** SAMPLE # **04** FRACTIONS: **A,B,C,D**
Date & Time Collected **12/08/89** Category

AG	**0.043 E** mg/L	**AS_HY**	212 S ug/L	**BE**	<0.02 mg/L	**CD**	0.054 mg/L	**CN**	104 ug/L	**CR**	0.449 mg/L
CR_HEX	**<0.001** mg/L	**CU**	4.73 mg/L	**HG**	6.9 ug/L	**NI**	1.39 mg/L	**PB**	3.3 mg/L	**SB**	3.0 S ug/L

SE_HY 8.2 S ug/L	**TL** <0.06 mg/L	**ZN** 16.4 D mg/L

SAMPLE ID **B-202 TIME 15 SLURRY** SAMPLE # **05** FRACTIONS: **A,B,C,D**
Date & Time Collected **12/08/89 12:00:00** Category

AG 0.034 E mg/L	**AS_HY** 216 S ug/L	**BE** <0.02 mg/L	**CD** 0.064 mg/L	**CN** 93 ug/L	**CR** 0.501 mg/L
CR_HEX <0.001 mg/L	**CU** 5.12 mg/L	**HG** 8.4 ug/L	**NI** 1.47 mg/L	**PB** 3.7 mg/L	**SB** 2.3 S ug/L
SE_HY 9.3 S ug/L	**TL** <0.06 mg/L	**ZN** 18.3 D mg/L			

SAMPLE ID **B-202 SEDIMENT** SAMPLE # **06** FRACTIONS: **A**
Date & Time Collected **12/06/89** Category

TOC_S 1190 mg/Kg

SAMPLE ID **B-203 TIME 0 SLURRY** SAMPLE # **07** FRACTIONS: **A,B,C,D**
Date & Time Collected **12/08/89 12:00:00** Category

AG 0.069 E mg/L	**AS_HY** 478 S ug/L	**BE** 0.04 mg/L	**CD** 0.104 mg/L	**CN** 81 ug/L	**CR** 0.735 mg/L
CR_HEX <0.001 mg/L	**CU** 9.12 mg/L	**HG** 14.6 ug/L	**NI** 2.00 mg/L	**PB** 11 D mg/L	**SB** 8.0 S ug/L
SE_HY 17.9 S ug/L	**TL** 0.20 mg/L	**ZN** 35.0 D mg/L			

SAMPLE ID **B-203 TIME 15 SLURRY** SAMPLE # **08** FRACTIONS: **A,B,C,D**
Date & Time Collected **12/08/89 12:00:00** Category

AG	0.067 E mg/L	**AS_HY**	448 S ug/L	**BE**	0.04 mg/L	**CD**	0.104 mg/L	**CN**	74 ug/L	**CR**	0.695 mg/L
CR_HEX	<0.001 mg/L	**CU**	9.24 mg/L	**HG**	38.4 ug/L	**NI**	2.07 mg/L	**PB**	11 D mg/L	**SB**	6.5 S ug/L
SE_HY	25.2 S ug/L	**TL**	0.19 mg/L	**ZN**	35.2 D mg/L						

SAMPLE ID **B-203 SEDIMENT** SAMPLE # **09** FRACTIONS: **A**
Date & Time Collected **12/06/89** Category

TOC_S	2530 mg/Kg

SAMPLE ID **B-204 TIME 0 SLURRY** SAMPLE # **10** FRACTIONS: **A,B,C,D**
Date & Time Collected **12/08/89 12:00:00** Category

AG	0.390 E mg/L	**AS_HY**	1560 S ug/L	**BE**	0.10 mg/L	**CD**	0.951 mg/L	**CN**	1450 E ug/L	**CR**	5.19 mg/L
CR_HEX	<0.001 mg/L	**CU**	59.9 D mg/L	**HG**	235.0 ug/L	**NI**	14.5 D mg/L	**PB**	68 D mg/L	**SB**	43.5 S ug/L
SE_HY	138 S ug/L	**TL**	1.12 mg/L	**ZN**	137 D mg/L						

SAMPLE ID **B-204 TIME 15 SLURRY** SAMPLE # **11** FRACTIONS: **A,B,C,D**
Date & Time Collected **12/08/89 12:00:00** Category

AG	0.429 E mg/L	**AS_HY**	2370 S ug/L	**BE**	0.10 mg/L	**CD**	1.22 mg/L	**CN**	580 ug/L	**CR**	6.10 mg/L
CR_HEX	<0.001 mg/L	**CU**	85.1 D mg/L	**HG**	99.0 ug/L	**NI**	23.2 D mg/L	**PB**	50 D mg/L	**SB**	70.2 S ug/L

RADIAN CORP. REPORT
Results by Sample

SE_HY	**147 S**	**TL**	1.24	**ZN**	195 D
	ug/L		mg/L		mg/L

SAMPLE ID **B-204 SEDIMENT** SAMPLE # **12** FRACTIONS: **A**
Date & Time Collected **12/05/89** Category

TOC_S	**12300**
	mg/Kg

STS CONSULTANTS, LTD

CYANIDE:
N\A = RESULT NOT AVAILABLE DUE TO CHANGE IN PHYSICAL STATE OF SAMPLE ON ACIDIFICATION FOR CYANIDE ANALYSIS.

E = ESTIMATED RESULT DUE TO CHANGE IN PHYSICAL STATE OF SAMPLE ON ACIDIFICATION DURING CYANIDE ANALYSIS.

METALS:

S = EXPLANATION IN APPENDIX.

D = EXPLANATION IN APPENDIX.

RADIAN CORP. REPORT
NonReported Work

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

01D	DIG_N	01A	TREAT
02D	DIG_N		
03A	SUBCON		
04D	DIG_N	04A	TREAT
05D	DIG_N		
06A	SUBCON		
07D	DIG_N	07A	TREAT
08D	DIG_N		
09A	SUBCON		
10D	DIG_N	10A	TREAT
11D	DIG_N		
12A	SUBCON		

Appendix A

Comments, Notes and Definitions

Notes and Definitions

*	Est. result less than 5 times detection limit
A	Analytical and/or post-digestion spike
B	Detected in blank,result not corrected
C	Confirmed on second column
D	Sample diluted for this analyte
E	Estimated result - see report narrative
G	Exceeds calibration range
J	Detected at less than detection limit
NA	Not analyzed
NC	Not calculated
ND	Not detected at specified detection limit
NR	Analyte not requested
NS	Not spiked
N\A	Not available
P	Previously confirmed
Q	Outside control limits
R	Detected in blank, result corrected
S	Determined by Method of Standard Addition
U	Unconfirmed-2nd column not requested
X	Not confirmed by analysis on 2nd column

Notes and Definitions

* The asterisk(*) is used to flag results which are less than five times the method specified detection limit. Studies have shown that the uncertainty of the analysis will increase exponentially as the method detection limit is approached. These results should be considered approximate.

A This flag indicates that a spike is an analytical and/or post-digestion spike. These spikes have not been subjected to the extraction or digestion step.

B This flag indicates that the analyte was detected in the reagent blank but the sample results are not corrected for the amount in the blank.

C Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation. The C flag indicates that the analyte has been confirmed by analysis on a second column.

D This flag identifies all analytes identified in analysis at a secondary dilution factor. In an analysis some compounds can exceed the calibration range of the instrument. Therefore two analyses are performed,one at the concentration of the majority of the analytes, and a second with the sample diluted so that high concentration analyte(s) fall within the calibration range.

Notes and Definitions

E The reported value is estimated because of the presence of interference. The potential source of the interference is included in the report narrative.

G This flag identifies a GC/MS result whose concentration exceeds the calibration range for that specific analysis. Usually if one or more compounds have a response greater than full scale, the sample or extract is diluted and re-analyzed.

J Indicates an estimated value for GC/MS data. This flag is used either when estimating a concentration for tentatively identified compounds where a response factor of 1 is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit.

NA This analyte was not analyzed.

NC Applies to RPD and spike recovery results. The relative percent difference (RPD) and spike recovery are not calculated when a result value is less than five times the detection limit or obvious matrix interferences are present. See * definition for further explanation of the unreliability of data near the detection limit. A spike recovery is not calculated when the sample result is greater than four times the spike added concentration because the spike added concentration is considered insignificant.

Notes and Definitions

ND This flag (or <) is used to denote analytes which are not detected at or above the specified detection limit. The value to the right of the < symbol is the method specified detection limit for the sample.

NR This analyte was not requested by the client.

NS This analyte or surrogate was not added (spiked) to the sample for this analysis.

N\A A result or value is not available for this parameter, usually a detection limit.

P Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation. The P flag indicates that the analyte has been confirmed previously. This flag is applicable to analyses of samples arising from a regular sampling program as a specific sample source; for example, a quarterly well monitoring program.

Notes and Definitions

Q This quality control standard is outside method or laboratory specified control limits. This flag is applied to matrix spike, analytical QC spike, and surrogate recoveries; and to RPD(relative percent difference) values for duplicate analyses and matrix spike/matrix spike duplicate result.

R This flag indicates that the analyte was detected in the reagent blank and the sample results are corrected for the amount in the blank.

S This flag indicates that a specific result from a metals analysis has been obtained using the Method of Standard Addition.

U Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation. The U flag indicates that second column was not requested.

X Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation. The X flag indicates a second column confirmation was performed but the analyte was not confirmed and is likely a false positive.

Notes and Definitions

TERMS USED IN THIS REPORT:

Analyte - A chemical for which a sample is to be analyzed. The analysis will meet EPA method and QC specifications.

Compound - See Analyte.

Detection Limit - The method specified detection limit, which is the lower limit of quantitation specified by EPA for a method. Radian staff regularly assess their laboratories' method detection limits to verify that they meet or are lower than those specified by EPA. Detection limits which are higher than method limits are based on experimental values at the 99% confidence level. Note, the detection limit may vary from that specified by EPA based on sample size, dilution or cleanup. (Refer to Factor, below)

EPA Method - The EPA specified method used to perform an analysis. EPA has specified standard methods for analysis of environmental samples. Radian will perform its analyses and accompanying QC tests in conformance with EPA methods unless otherwise specified.

Factor - Default method detection limits are based on analysis of clean water samples. A factor is required to calculate sample specific detection limits based on alternate matrices (soil or water), use of cleanup procedures, or dilution of extracts/ digestates. For example, extraction or digestion of 10 grams of soil in contrast to 1 liter of water will result in a factor of 100.

Matrix - The sample material. Generally, it will be soil, water, air, oil, or solid waste.

Radian Work Order - The unique Radian identification code assigned to the samples reported in the analytical summary.

Units -

ug/L	micrograms per liter (parts per billion);liquids/water
ug/Kg	micrograms per kilogram (parts per billion); soils/solids
ug/M3	micrograms per cubic meter; air samples
mg/L	milligrams per liter (parts per million);liquids/water
mg/Kg	milligrams per kilogram (parts per million);soils/solids
%	percent; usually used for percent recovery of QC standards
uS/cm	conductance unit; microSiemans/centimeter
mL/hr	milliliters per hour; rate of settlement of matter in water
NTU	turbidity unit; nephelometric turbidity unit
CU	color unit; equal to 1 mg/L of chloroplatinate salt